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VIA FACSIMILE AND POST

Our ref: TBS/BAR/37402.WOP

Your ref:

04 January 2005

European Patent Office
D-80298 Munich
Germany

For the attention of C De Jongh

Dear Sirs

Re: International Patent Application No PCT/GB2003/004470
In the name of PIKE, Anthony Bruce
Linear Bearing

In response to the Written Opinion of 15 September 2004, the period of response being kindly extended until 4 January, I respond as follows:-

1. The Examiner has appreciated that the invention concerns the provision of a frame which can be moved relative to two surfaces lying opposite to each other either side of the frame, the frame having a first and a second matrix of spheres, so mounted in the frame that when the frame is moved relative to the opposed surfaces, the spheres of the first matrix are caused to move in one direction whilst spheres of the second matrix are caused by impingement of its spheres on the spheres of the first matrix to rotate in the opposite direction of the spheres of the first matrix.

2. The corresponding British patent, which has now been granted, did not include the objected-to figures 10 to 12, which incidentally contain crucial errors between the informal drawings filed with this application and the formal drawings as published. Therefore, it is proposed, for the sake of simplicity at the present stage of the application, to bring this application into line with the granted British patent, bearing in mind differences in practice and the Examiner's helpful comments.

To: European Patent Office – Munich
Attention: C De Jongh

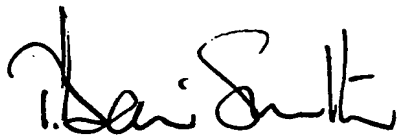
04 January 2005

3. Accordingly, claims 8, 9 and 10 are deleted, as is the subject matter of those claims from line 26 on page 7 and on page 8. On page 5, references to Figures 8 to 12 are also deleted. Rights to the subject matter of the deleted matter with regard to any divisional applications or continuation-in-part or continued applications in The United States are not abandoned and are currently only deleted for the purposes of obtaining a favourable report in respect of the retained claims 1 to 7.

4. Claim 1 has been amended to acknowledge reference D1 (US 4,860,875) and has been rewritten with the additional wording after the final word of the original claim, as follows:-

"Characterised in that the spheres of the one matrix are arranged to project from one side of the frame and the spheres of the other matrix are arranged to project from the opposite side of the frame, the spheres of each matrix being constrained to be retained in the same relative position with respect to the frame during rotation". Pages 9 and 10 enclosed herewith have been duly amended. Pages 5, 7 and 8 are enclosed herewith showing the deletions. Reference numerals have been added to the claims.

Yours faithfully



Tim Bain Smith
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Encls

CLAIMS

1. A bearing comprising a frame (2) at least partly surrounding two matrices (12, 16), each of a plurality of spheres (10, 14), each matrix when flat having its spheres mounted for rotation in substantially a single planar or at least part spherical plane, the plane of one matrix being parallel to that of the other matrix, the spheres of one matrix located so as to lie at least mostly against the spheres of the other matrix so that rotation of spheres of one matrix results in counter rotation of spheres of the other matrix, characterised in that the spheres of the one matrix are arranged to project from one side of the frame and the spheres of the other matrix are arranged to project from the opposite side of the frame, the spheres of each matrix being constrained to be retained in the same relative position with respect to the frame during rotation.

2. A bearing according to claim 1 wherein the spheres are between 25 mm and 15 mm in diameter.

3. A bearing according to claim 1 or 2 further comprising an inflatable platform (22) arranged to be detachably joined to the bearing.

4. A bearing according to claim 3 wherein the inflatable platform is provided with detachable poles (26) disposable on either side of the platform and so arranged for carrying the platform.

5. A bearing according to claim 1 wherein the spheres are between 2.5 and 7.5 mm in diameter.

6. A bearing according to claim 1 or 5 wherein the spheres are woven into each matrix (Figures 5 and 6).

7. A bearing as claimed in claim 1 wherein the matrices are curved in one or more planes.

Figure 9 is an exploded perspective view of the platform of Figure 8;

Figure 10 is a diagrammatic view of another embodiment of the invention showing a spherically linear bearing and a rectilinear bearing;

Figure 11 is a diagrammatic side view of a resilient linear bearing according to an alternative embodiment of the invention; and

Figure 12 is a diagrammatic view of a rotatable or rectilinear movable bearing according to a still further embodiment of the invention.

The bearing in the form of a mat of Figure 1 is formed with a frame 2 made of a flexible plastics material having a chamfered edge 4 and supporting an upper perforated sheet 6 and a lower perforated sheet 8. The upper perforated sheet locates a plurality of spheres 10 and together they form a first matrix 12. The lower perforated sheet 8 locates rows of spheres 14 which form a second matrix 16. The upper rows of spheres 10 of the first matrix seat on the lower spheres of the second matrix in such a way that most of the upper spheres each are supported on four lower spheres.

The upper spheres 10 located in perforations 18 of sheet 6 are such as to allow free rotation of spheres 10. Similarly, perforations 20 in lower sheet 8 allow free rotation of spheres 14. Since the upper spheres are seated on the lower spheres, any rotation of the lower spheres will cause counter rotation of the upper spheres. In this way, any movement of bearing 1 when placed on the ground will cause the upper spheres to move in the opposite direction to the bearing.

The spheres 10 and 14 are preferably made of hard plastics

either used to transfer a patient from a stretcher on to the bed or else pulled under the patient so that the patient can be lifted off the bed for changing sheets. For this purpose the spheres 50 (see Figures 5 and 6) are about 5 mm in diameter or less. The bearing for this embodiment is formed by threading the spheres on sacrificial thread 52 and weaving the threaded spheres into a matrix, then dissolving the sacrificial thread to leave the spheres rotatably supported by the weave 54 of the woven matrix.

Figure 7, 8 and 9 show a substantially rigid composite plate 60 incorporating the bearing of the invention in which a first matrix 62 of spheres 61 is located above a second matrix 64. Each matrix is carried in a perforated sub plate 65, 65′ which are secured together as shown in Figure 7.

In Figure 9 there can be seen telescopic arms 70 which attach by means of ball joints 72 and brackets 74 to the top sub plate 65′. These arms are designed to push the plate 60 under an article, in particular an injured person, so that the person is not subject to injurious movement whilst being transferred from one location (e.g. an accident site) to another (e.g. an ambulance). Carrying handles (not shown) can be provided on the plate.

Figure 10 is a diagrammatic view of, for instance, a ship to shore gangway or vehicular connection between shore and pontoon - the relative movement between ship and shore is similar to that between pontoon and shore. In this case, the shore is shown at 80 and pontoon at 82. Between shore and pontoon is a "bridge" 84 which has a semi spherical bearing surface 85 at one end and a bearing plate 86 mounted at 87 to the bridge.

The bearing surface 85 fits over a spherical plate 88 of spheres 89 of, say, between 2.5 and 7.5 mm held in two matrices 90 and 92. Matrices 90 and 92 are fixed to semi

spherical post head 94, fixed to shore 80. This arrangement allows the bridge to incline or to move in azimuth relative to the shore. At the pontoon end of the bridge, the bearing plate 86 also includes a pair of matrices 96 and 98 of spheres 100 of, say, 15 to 25 mm. Because of the interconnection between the matrices 96 and 98, the pontoon end of the bridge is able to move relative to the pontoon 82, transversely with respect to the pontoon or towards or away from the pontoon. The spheres 100 are larger than the spheres 89 to allow for the rougher upper surface 101 of pontoon 82, compared to the semi spherical post head 94.

Figure 11 shows a different application for the invention for supporting a bridge deck 110 on a vertical structure 112 where a small amount of lateral and longitudinal movement is required. The bearing shown has an upper member 114, seating via an elastomeric junction portion 116 of a lower member 118. The lower member has a first matrix 120 of spheres 121 which seat on a separate matrix 122 of spheres 121, both the matrices 120 and 122 being limited for movement by surround 124. The upper member 114 is also located relative decking 110 by surround 126. The design of the lower surround 124 and the height of the surround depend on the relative movement between structures 110 and 112 which are anticipated. The arrangement is designed to reduce the stress in the elastomeric joint 116 which only needs to account for vertical movement.

Figure 12 shows an arrangement which, depending upon the interpretation of the cross section, can either provide for circular or rectilinear movement. The arrangement can also provide for both rectilinear and circular movement in the same embodiment. The application is intended for a heavy civil engineering solution where the track formation shown at 130, having track 132, is formed where necessary with a lower track bedding plate 134. A leg 136 has a footplate 138 which can be square or circular and which sits on a twin matrix frame 140, each matrix having spheres 142.

CLAIMS

1. A bearing comprising a frame (2) at least partly surrounding two matrices (12, 16) each of a plurality of spheres (10, 14) each matrix when flat having its spheres mounted for rotation in substantially a single planar or at least part spherical plane, the plane of one matrix being parallel to that of the other matrix, the spheres of one matrix located so as to lie at least mostly against the spheres of the other matrix so that rotation of spheres of one matrix results in counter rotation of spheres of the other matrix (as dictated).

2. A bearing according to claim 1 wherein the spheres are between 25 mm and 15 mm in diameter.

3. A bearing according to claim 1 or 2 further comprising an inflatable platform (22) arranged to be detachably joined to the bearing.

4. A bearing according to claim 3 wherein the inflatable platform is provided with detachable poles (26) disposable on either side of the platform and so arranged for carrying the platform.

5. A bearing according to claim 1 wherein the spheres are between 2.5 and 7.5 mm in diameter.

6. A bearing according to claim 1 or 5 wherein the spheres are woven into each matrix (Figures 5 & 6).

7. A bearing as claimed in claim 1 wherein the matrices are curved in one or more planes.

8. A bearing as claimed in claim 1 wherein the frame is attached to an upper or lower member via an elastomeric layer.

Delete also claims 9 and 10.